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Research Article

Pranayama-an alternative supportive therapy against oxidative stress in essential hypertension

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ABSTRACT

Background: Essential hypertension is one of the most prevalent diseases of the world. The underlying pathophysiological abnormalities that lead to the development of the elevated arterial pressure in this disorder remain elusive. Pranayam (yogic breathing exercises) techniques are beneficial in treating a range of stress related disorders such as hypertension and reducing signs of oxidative stress. The present study was undertaken to check effect of Pranayam on oxidative stress in cases of essential hypertension before and after Pranayam.
Methods: Total 100 hypertensive subjects and 100 sex matched controls were enrolled in this study. Inclusion criteria include patients with blood pressure ≥ 140/90 mm of Hg, while patients with secondary hypertension, stroke, CAD, MI and diabetes mellitus were excluded. Serum PON-1 was estimated spectrophotometrically by Charlton Menys.V method. Serum SOD estimated spectrophotometrically by Mishra H.P. & Fridovich I,1972 method and Plasma MDA by colorimetric method of Satoch K.et al. We estimated PON-1, SOD and MDA in hypertensive and controls, then we suggested hypertensive for 3 months Pranayam, again the same parameters were measured and compared by using Students T test and one way ANOVA to determine significant differences.
Results: Before Pranayam, PON-1 activity was decreased significantly (<0.001) in hypertensive subjects compared to controls. SOD was also decreased significantly ($p<0.001$) in hypertensives compared to controls and MDA was increased significantly ($p<0.001$) in hypertensives compared to controls, But after 3 months Pranayam, there was significant ($p<0.001$) improvement in PON-1 and SOD activity in hypertensives and significant ($p<0.001$) decrease in MDA levels in hypertensives compared to hypertensives before Pranayam.
Conclusions: It is concluded that Pranayam can significantly reduce oxidative stress i.e. generation of free radicals, lipid peroxidation products (MDA) and significant increase in the level of antioxidant enzymes i.e. SOD & PON-1.MDA is a marker of oxidative stress. Pranayam not only reduces oxidative stress but also improves antioxidant status of the individual.

Keywords: Pranayam, Paraoxonase, Superoxide Dismutase, Malondialdehyde

INTRODUCTION

Essential hypertension is one of the most prevalent diseases of developed Western societies and is an unequivocal risk factor for cardiovascular morbidity and mortality. Several researchers have reported that Pranayam techniques are beneficial in treating a range of stress related disorders such as hypertension, improving autonomic function and reducing signs of oxidative stress. Practitioners reported that the practice of Pranayam develops a steady mind, strong will-power, and sound judgment, and also claim that sustained Pranayam practice extends life and enhances perception.[1] Hypertension is one of the major cause of atherosclerosis and Paraoxonase is antiatherogenic and is sensitive to oxidative stress.[2,3] Oxidative stress occurs when there is imbalance between the generation of reactive oxygen species (ROS) and the antioxidant defense systems so that the latter becomes overwhelmed.[4,5] Endogenous antioxidants enzymes such as superoxide dismutase (SOD) counteract the oxidative damage to protect against oxidative stress. Malondialdehyde (MDA) is a breakdown product of peroxidation of long chain fatty acids which accumulates when lipid peroxidation increases.[6] The underlying pathophysiological abnormalities that lead to the development of hypertension and the overall mechanism by which Pranayam reduces oxidative stress remain elusive. This study aims at understanding the role of Pranayam in reducing oxidative stress in hypertension

METHODS

The study was carried out in the Department of Biochemistry, Gandhi Medical College, Bhopal (M.P.) in collaboration with the Department of Medicine, with the approval of protocol by the Ethics Committee of the institution. After obtaining informed consent from the subjects a hospital based crossectional study was carried out. A total of 362 adults in the age range of 20-60 years were screened, residing in the urban and rural surrounding of Bhopal which had representative mix of subjects from different communities. Based on the criteria scheduled in the Seventh Report of the Joint National Committee on Prevention Detection, Evaluation and Treatment of High Blood Pressure (JNC-7), 136 subjects identified as hypertensives and 94 as normotensives. Sample size was estimated on the basis of reported prevalence of hypertension in M.P. equal to 38%. Out of 136 hypertensive and 94 normotensives subjects, 100 subjects from hypertensive were selected for study who fulfilled inclusion criteria [SBP 120-139mmHg and/or DBP 80-89mmHg (JNC-7)] and they were compared with 100 age and sex matched healthy controls. Biochemical parameters (PON-1, SOD &MDA) were analyzed before and after 3 months of Pranayam. 126 Patients with secondary hypertension, past history of stroke, diabetes mellitus, MI, CAD and patients below and above 20 & 60 years were excluded. Paraoxonase was estimated spectrophotometrically by the Charlton-Menys V method.[7] SOD was estimated by spectrophotometric method of McCord JM et al.[8] MDA was estimated by colorimetric method of Satoch K et al.[9]

Statistical analysis

The statistical analysis was done by using the Statistical Package for Social Sciences (SPSS 17). The results were expressed as Mean ± Standard Deviation (SD). The differences between the groups were analyzed by using the Student's "t"-test and one way ANOVA. The p value <0.001 was considered as highly significant, p value <0.01 as moderate significant while p value >0.05 as insignificant.

RESULTS

Demographic characteristics of hypertensives and controls have been discussed which includes age & sex (Table 1).

Table 1: Demographic characteristics of study population.

S.No.	Variables	Hypertensive (n=100)	Controls (n=100)
1.	Age (in yrs)	54.10±8.16	32.96±6.12
2.	Sex (M/F)	58/42	55/45

Haemodynamics of study population before and after Pranayam shown by Table 2.

Before Pranayam, PON-1 level and SOD level were significantly (p<0.001) decreased in hypertensives compared to controls. MDA was significantly (p<0.001) increased in hypertensive subjects compared to controls. But when hypertensives were suggested for 3 months Pranayam , there was significant (p<0.001) increase in PON-1 and SOD levels while MDA decreased significantly(p<0.001) when compared to cases before Pranayam (Table 3).These results indicates that Pranayam plays a potent role in suppression of oxidative stress in hypertensive subjects

Pranayam (Yogic breathing exercises) in hypertension is shown by Figure 1.

Figure 1: Pranayam (yogic breathing exercises) in hypertension.

Table 2: Hemodynamics of study population.

Blood pressure	Mean±SD			P value		
	Control(A) Average (both sexes)	Before Pranayam (B)	After Pranayam (C)	A - B	A - C	B - C
Systolic (120 mmHg)	118.7+4.89	164.5+13.6	152.42±9.38	<0.001	<0.001	<0.001
Diastolic (<90mmHg)	77.67+5.94	94.20+6.11	88.49±1.42	<0.001	<0.001	<0.001

Table 3: Biochemical profile of study population (Comparison done by student's t test and one way anova)

Parameters	Mean±SD			P value			
	Control (A)	Before Pranayam (B)	After Pranayam (C)	F score	A - B	A - C	B - C
PON-1 (U/L) (113-431 U/L)	365.16±10.02	326.87±11.33	342.42±9.38	136.9	<0.001	<0.001	<0.001
SOD (enz-units/mg Pro/ml)(10.2-15.2 enz-u/mg/pro/ml)	12.87±1.36	9.47±1.22	11.49±1.42	170.1	<0.001	<0.001	<0.001
MDA (mmol/L) (2-4 mmol/L)	2.61±0.58	4.8±9.74	3.6±1.49	212.6	<0.001	<0.001	<0.001

DISCUSSION

Hypertension remains silent being generally asymptomatic during its clinical course. As it is hidden beneath an outwardly asymptomatic appearance the disease does immense harm to the body in the form of "Target organ" damage, hence the WHO has named it the "Silent killer". Sarkar PD et al. studied relationship between paraoxonase activity and lipid levels in ischemic stroke patients and found decreased PON & HDL concentration in ischemic patients compared to controls.[10]Also, Gonenc A studied paraoxonase activity in hypertensive patients according to their study PON-1 activity were found at low level in patients with hypertension compared to controls ($p<0.01$).[11] In our study, we also found decreased PON-1 activity in hypertensives compared to controls but when they were suggested Pranayam, PON-1 level increased. Similarly, Gupta N et al. studied role of paraoxonase in coronary artery disease, their study showed that PON-1 status i.e. its activity and concentration is considered to be more important than polymorphism alone in prevention of CAD.[12]

We found increased oxidative stress in hypertensives compared to controls after Pranayam it gradually decreased in hypertensives before Pranayam. This finding correlates with study done by Saxena T et al. that showed the increased oxidative stress and decreased antioxidant activity in Pre HTN subjects.[13] Our study coincides with the study done by Bhavanani AB et al. which showed immediate effect of Sukha Pranayam on cardiovascular variables in patients of hypertension.[14] Bhavanani AB et al. studied immediate effects of performing pranava pranayama on cardiovascular parameters in hypertensive patients.[15]

The aim of our study has been to assess the effect of yogic breathing exercises (Pranayam) on the oxidative stress. Because of Pranayam free radicals were decreased significantly in the study group. SOD and PON-1 were increased significantly ($p<0.001$) in hypertensives after Pranayam as compared to hypertensives before Pranayam. Yogic breathing exercises not only help in relieving the stresses of life but also improve the antioxidant status of the individual.[16] Yoga therapy (Pranayam) concentrates on empowerment of body and mind, through its integrated holistic approach one can overcome the different kinds of afflictions in life.

Limitations of the Study

Patients included in the present study were attended O.P.D of Medicine department. This study was subjected to 100 hypertensive cases within 20-60 years of age. The laboratory of biochemistry is well equipped with semi autoanalyser, colorimeter and spectrophotometer. Hence, all investigation was carried out on auto analyser and

spectrophotometer. All investigation methods used in this study were standardized in our laboratory. Duration of Pranayam could be increased up to 6 months so that prolonged effects of Pranayam could be assessed. All the prehypertensives were excluded from our study.

In conclusion, our study has documented impaired paraoxonase activity and high oxidative stress in hypertensive subjects and has pointed to the significance of Pranayam in controlling oxidative stress at early stage of hypertension by change in lifestyle. Changes in lifestyle may involve dietary intervention, increase in physical exercise for controlling blood pressure, avoidance of smoking and control of overweight and obesity. By proper education regarding meditation and regular yogic exercises in the form of Pranayam can make miracle in the life of hypertensive subjects and we can check harmful effects of high blood pressure in the beginning of disease i.e. in early stage of hypertension by reducing oxidative stress and improving antioxidant status of body. Because "Prevention is better than cure".

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REFERENCES

1. Pranayam Swami Ramdev .Yog Its philosophy and practice:Haridwar Divya Prakashan;2005-3,pp 43-83.
2. Aviram M, Hardak E, Vaya J, Mahmood S, Milo S, Hoffman A et al.Human serum paraoxonase (PON1) Q and R selectively decrease lipid peroxides in human coronary and carotid atherosclerotic lesions.PON-1 esterase and peroxidase-like activities.Circulation. 2000;101:2510-7.
3. Durrington PN, Mackness B, Mackness MI.Paraoxonase and atheroscelerosis. Arteriosclerosis, Thrombosis, and Vascular Biology. 2001;21:473-80.
4. Masanori Okuda, Nobutaka Inoue, Hiroshi Azumi, Tadashi Seno, Yoshihiko Sumi, Ken-ichi Hirata et al. Expression of Glutaredoxin in Human Coronary Arteries. Its Potential Role in Antioxidant Protection against Atherosclerosis. Arteriosclerosis, Thrombosis, and Vascular Biology. 2001;21(9): 1483-7.
5. Ceconi C1, Cargnoni A, Pasini E, Condorelli E, Currello S, Ferrari R. Lipid peroxidation during myocardial reperfusion. Mol Cell Biochem. 1992;111(1-2):49-54.
6. Cathcart MK. Regulation of superoxide anion production by NADPH oxidase in monocytes/macrophages: contributions to atherosclerosis. Arterioscler Thromb Vasc Biol. 2004;24(1):23-8.
7. Charlton-Menys V, Liu Y, Durrington PN. Semi automated method for the determination of serum paraoxonase activity using paraoxon as substrate. Clin Chem. 2006;52(3):453-7.
8. Mc Cord JM, Fridovich I. Superoxide dismutase. An enzymic function for erythrocuprein (hemocuprein). J Biol Chem. 1969;25;244(22):6049-55.
9. J. St. L. Philpot. The Estimation and Identification of Organic Peroxides. Radiation Research Supplement. 1963;3(3):55-80.
10. Sarkar PD, Shivprakash T.M., Madhusudhan B. Association between paraoxonase activity and lipid levels in patients with premature coronary artery disease.Clinica Chimica Acta. 2006;373(1-2):77-81.
11. Aymelek Gonenc oxidized low-density protein, interleukin-6 and tumor necrosis factor alpha levels and paraoxonase activities in hypertensive patients.Turk J Pharm Sci. 2012;9(1):41-50.
12. Gupta Nidhi, Gill Kirandip, Singh Surjit. Paraoxonases. Structure, gene polymorphism & role in coronary artery disease. Indian Journal of Medical Research. 2009;130(4):361-8.
13. Saxena T, Agarwal BK, Sharma V.K., Naz S, Lanke P. Paraoxonase Activity in Prehypertension and its Relation to Oxidative Stress. Biomedical and pharmacological journal. 2013;6(2):389-94.
14. Bhavanani AB, Sanjay Z, Madanmohan. Immediate effect of sukha pranayama on cardiovascular variables in patients of hypertension. Int J Yoga Therap. 2011;(21):73-6.
15. Bhavanani AB, Madanmohan, Sanjay Z, Basavaraddi IV. Immediate cardiovascular effects of pranava pranayama in hypertensive patients. Indian J Physiol Pharmacol. 2012;56(3):273-8.
16. Bhattacharya S1, Pandey US, Verma NS.Improvement in oxidative status with yogic breathing in young healthy male. Indian J Physiol Pharmacol. 2002;46(3):349-54.

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